

Title: Demonstration of a Continuous, Real-time Biomonitor for the Detection of Toxic Chemicals in Water

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Abstract

Rapid detection of toxic chemicals in drinking water supplies is complicated by the wide range of potential chemical threats and a limited capability for continuous, real-time monitoring of drinking water contaminants. An automated biomonitoring system has been developed to provide a rapid response to developing toxicity caused by a broad spectrum of individual chemicals or chemical mixtures. The biomonitor detects sublethal changes in fish behavior by continuously tracking the ventilatory rate and depth, cough rate, and whole body movement of eight individual fish (bluegills, *Lepomis macrochirus*). Key water quality parameters monitored continuously include temperature, dissolved oxygen, pH, and conductivity. When changes in fish behavior cause a pre-determined alarm threshold to be exceeded, the biomonitor initiates an automated water sampler to allow follow-on analytical chemistry evaluations and provides immediate notification of appropriate individuals through an autodialer. Software enables access to the ventilatory data from remote locations for alarm follow-up and diagnostic evaluations. Use of two sets of eight fish ensures continuous water monitoring, and routine maintenance is approximately four hours per week. Data for a limited number of chemicals indicate that the biomonitor is likely to respond within an hour to concentrations at or below the 96-h LC50 (the level lethal to half the exposed animals in 4 days). The biomonitor is now being used to continuously monitor source water for a water treatment plant. Biomonitor improvements in progress include a graphical user interface, an expert system to better identify biomonitor responses due to toxicity, and Internet accessibility. The biomonitor complements chemical surveillance techniques by providing continuous, real-time monitoring for unsuspected chemicals, chemical mixtures, and transient events, and by giving early warning of potential toxicity.

References:

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